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The relationship between the Wechsler-Bellevue subtests and academic achievement using institutionalized retardates

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THE RELATIONSHIP BETWEEN THE WECHSLER-BELLEVUE SUBTESTS AND
ACADEMIC ACHIEVEMENT USING INSTITUTIONALIZED RETARDATE

by

Fred Richard Seybold

A Thesis

Presented to

the Graduate Faculty of the Department of Psychology

University of Omaha

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

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CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

The relation of intelligence to achievement is complex, and studies have yielded varying and inconsistent results. It is recognized that intelligence is only one variable of many which contributes to some degree to one's educational attainments. However, in the case of mental retardation, there is no doubt that intelligence is one of the most important factors influencing academic achievement.

This study is concerned with the various types of intelligence and how they relate to school achievement. It has been generally accepted that intelligent behavior is manifest in a number of ways. While these different ways are not necessarily factorially pure, some are sufficiently discrete to suggest that a number of separate mental functions contribute to what is called general intelligence. This does not exclude the existence of an underlying general factor, as a matter of fact, the commonly-held theories of intelligence assume a general factor. A good intelligence test attempts to sample the various cognitive processes, and like all good samples is expected

to carry within it a microcosm of the whole. The final results are generally expressed by a single score, usually an IQ or percentile rank. In such a process, valuable information regarding each of the specific functions is disregarded. The recent development of the so-called "factored" tests are certainly promising, and represent a refinement of psychological testing. These tests permit an analysis of different aspects of intelligence. Guilford, in his discussion on the "structure of intellect", analyzes the situation in this manner:

The advent of multiple-factor analysis has done something to broaden and enrich our conception of human intelligence, but factor theory and the results of factor analysis have had little effect upon the practices of measurement of intelligence. We do have a great variety of tests in such intelligence scales as the Binet and its revisions and in the Wechsler scales, to be sure. Too commonly, however, a single score is the only information utilized, and this single score is usually dominated by variance in only one or two factors. There is some indication of more general use of part scores, as in connection with the Wechsler tests, but each of these scores is usually factorially complex and its psychological meaning is largely unknown as well as ambiguous.¹

In the clinical setting, the refinement of psychological tools takes the form of research with the old tests more than the introduction of new tests. Occasionally new revisions are published or the norms are changed,

¹J. P. Guilford, "The Structure of Intellect," Psychological Bulletin, LII (1953), 267.

but the basic theory and form remain unaltered.

I. THE PROBLEM

Statement of the problem. This study may be said to be an attempt at refining the Wechsler-Bellevue Scale of Intelligence by analyzing each of its subtests with regard to academic achievement. The primary purpose was to determine the extent to which the various subtests are related to the Reading, Spelling, and Arithmetic sections of the Wide Range Achievement Test (WRAT). A secondary problem investigated was the relationship between school achievement and the subtest variability. In general, this investigation was an effort to determine whether or not the Wechsler Scale has the intrinsic capacity for diagnosing school failure or predicting level of school success with retardates, and if so, to delineate the clinical signs and characteristics.

Importance of the study. This study has particular significance in its relation to mental retardation. With the growing emphasis on treatment and training for the retarded, there is an increasing need for more refined diagnostic and prognostic measurements. An instrument that could reliably predict one's potential for academic achievement would be extremely valuable. The discovery of

some of the causes underlying academic failure might be of even greater value, particularly to educators and school psychologists who concern themselves with the development of more effective methods of instruction.

Limitations. The scope of this study is narrow, in the sense that the sample studied consists of less than one hundred subjects of a single State institution. This particular institution is most likely not representative of all institutions for the mentally retarded, and the institutionalized retardate is certainly not representative of the total retarded population. There is no assurance that the educational systems of various institutions are equivalent, or even similar in their educational approach, quality, or area of emphasis. It would indeed be presumptuous to make universal generalizations without many verifying replications.

This study was limited primarily to psychological functions of a cognitive nature, and only to those functions which are represented in the Wechsler Scale. It is recognized that there are many cognitive and conative functions valuable in determining academic success which are not included in this study.

Two additional limitations deserve only brief remarks: first, the inadequacies of the tests themselves,

which are discussed in Chapter III; and secondly, the failure on the part of some examiners to follow precisely the rules under which the tests were standardized. These deviations are not believed to be serious enough to appreciably alter or invalidate the results.

II. DEFINITIONS OF TERMS USED

Intelligence. It is not the purpose of this paper to present a detailed analysis of intelligence, or of the various theories of mental abilities, since these problems are too encompassing and technical to discuss adequately in this paper. As a matter of orientation, however, some of the more popular theories and current opinions deserve mention.

It has been said that there are probably as many definitions of intelligence as there are psychologists. Freeman has classified most definitions of intelligence into three groups, which are not mutually exclusive but vary only in the emphasis.² The first group emphasizes adjustment or adaptation to one's total environment. This means the more intelligent person has the ability to reorganize his behavior so as to act more effectively in

²Frank S. Freeman, Theory and Practice of Psychological Testing (third edition; New York: Holt, Rinehart, and Winston, 1962), pp. 149-151.

novel situations. The second group emphasizes learning capacity, or the ability to acquire information and knowledge. This group of definitions has been largely discredited by Simrall,³ but the relation between learning and intelligence is still recognized. The third group of definitions emphasizes the ability to carry on abstract thinking, meaning specifically the effective use of verbal and numerical symbols and concepts in dealing with complex reasoning problems.

Others have postulated comprehensive definitions which usually include the three above and add several more. Wechsler's definition fits into this latter category; "Intelligence is the aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment."⁴

The analysis of mental abilities is generally discussed with respect to three basic theories: Thorndike's Multi-factor theory, Spearman's Two-factor theory, and Thurstone's Group-factor theory. According to Thorndike, intelligence is said to be constituted of a multitude of

³Dorothy Simrall, "Intelligence and the ability to learn," Journal of Psychology, XXIII (1947), 27-43.

⁴David Wechsler, The Measurement of Adult Intelligence (third edition; Baltimore: Williams and Wilkins, 1944), p. 3.

separate factors, or elements, each one being a minute element of ability. His theory is considered "atomistic" and denies the existence of a general factor of intelligence.

Opposed to Thorndike's theory is Spearman's Two-factor theory. All intelligent activity, claims Spearman, is dependent upon, and is an expression of, a general factor called g. It is possessed by all individuals in varying amounts, and it varies in different mental tasks.

Spearman postulated the g factor in the first place to explain high correlations he found between diverse sorts of perceiving, knowing, reasoning, and thinking. Since the correlations were not perfect he postulated the existence of specific factors (s). The g factor was suggested by Spearman as the general fund of cortical energy, while the s factor was referable to special cortical areas to which the g factor was mobilized. Spearman later recognized that some group factors should be posited to explain test findings, but still placed major emphasis upon the g factor.⁵

Intermediate between Thorndike's and Spearman's theories are the Group-factor theories, of which Thurstone's is one of the most highly developed. According to this

⁵ Charles Spearman, The Nature of Intelligence and the Principles of Cognition (London: Macmillan and Co., 1927).

theory, intelligence is made up of primary factors which are relatively independent of each other. Each group is a primary factor which gives certain mental operations a functional unity and cohesiveness and which differentiates them from other mental operations. Thurstone, like Spearman, also later revised his theory to incorporate a "second order general factor". Thus, the Two-factor theory and the Group-Factor theory, both of which emerged from factor analysis, were drawn closer together, differing only in the point of emphasis.

Freeman makes the following explanation of intelligence and the discovered instability of certain group factors,

. . . intelligence is not an entity that operates in a vacuum; it is not something "given", even in the sense that some physical traits are "given", such as the color of eyes and hair, the number of digits. Intelligence is, rather, a name for certain kinds of activity; we can know of it only through its manifestations in behavior. Intelligent behavior develops and is manifested in one kind of environment or another; hence, the particular form of expression that intelligent activity takes will depend upon the sort of functions developed and fostered in a given cultural environment.⁶

The Wechsler-Bellevue Subtests. Wechsler, in his latest book, discusses the factorial components of his eleven subtests. By analysing and collating the results

⁶Freeman, op. cit., p. 166.

of several factorial studies, he finds, in general, four recurring factors. Nearly all of the studies used the Thurstone centroid method, and were done on both normal and abnormal adult subjects, but none were done with retarded subjects. Although most of the subtests were found to be factorially complex, the four factors and the highest subtest loadings are as follows:

- I. A general factor which is similar if not identical with Spearman's g factor. It accounts for about 50 per cent of the total variance contributed by all of the tests, and does not change much with age. It shows large loadings in all tests and is sometimes referred to as the educative or general reasoning factor.
- II. A verbal comprehension factor, described as the ability to derive meaning from words singly or in combination. It is best represented in the subtests Vocabulary, Information, Comprehension, and Similarities.
- III. A non-verbal organization factor found in all age groups has the highest loadings in Object Assembly and Block Design, and to a lesser extent in Picture Arrangement and Picture Completion. Its main determinant seems to be a capacity to organize discreet spacially perceived units into larger wholes or configurations.
- IV. A memory factor is found to be strongest in Digit Span and Digit Symbol, and to a lesser extent in Arithmetic, Information, and Picture Arrangement. The memory factor is much more important in old age than in youth.⁷

⁷David Wechsler, The Measurement and Appraisal of Adult Intelligence (fourth edition; Baltimore: Williams and Wilkins, 1958), pp. 118-134. The indented material is paraphrased rather than directly quoted.

In working with the Wechsler-Bellevue Scale, clinicians have found it helpful to postulate several basic thought functions suited for appraisal by each of the eleven subtests, so that inferences may be drawn from the relationships between the subtests. Although factor-analysts have determined considerable communality between subtests, clinicians, relying upon clinical experience and theoretical formulations based upon these experiences, continue to emphasize the specificity of measurement for each of the subtests. Rapaport's analysis of the subtests is somewhat clearer than Wechsler's original analysis, and lends itself more adroitly to the interpretive findings of this study. For this reason, the following resumé of the thought functions sampled by each of the eleven subtests stems from the work of Rapaport and associates:

Information. This may be considered a test of memory; not rote memory but rather the memory of specific facts, words, objects, and relationships which become integrated into the individuals unique frame of reference, by virtue of their appeal to his needs, strivings, interests, or affects. The wealth of information eventually acquired depends on natural endowment and early educational (cultural) stimulation. Excessive reliance on repression may interfere with recall during testing.

Comprehension. This subtest tests judgment. This implies the effortless and automatic sizing up of a situation and the mobilization of such information as will lead to an appropriate action. It emphasizes the conventional type of judgment rather than the creative, and it is adversely affected by emotional maladjustments.

Digit Span. The primary thought function involved in this test is attention. Attention is here defined as a relatively effortless, passive, and non-selective registering of stimulation in consciousness. The intrusion into consciousness of overcharged ideas, anxieties, and affects have been found to impair performance on this test.

Arithmetic. This is primarily a test of concentration, in that it requires the direct focusing of attention, and a meaningful manipulation of complex thought patterns. The opportunity to acquire the four basic arithmetical processes is understood, and it is assumed that these processes are already well ingrained through ordinary life experiences.

Similarities. This subtest is believed to measure verbal concept formations. The task involves a search for a conceptual abstraction or generalization under which two objects or ideas can be subsumed. The level of conceptual thinking is disrupted in many forms of maladjustment.

Vocabulary. Memory and concept formation are focal in the acquisition and organization of the experiential contexts that give words their meanings. This subtest reflects the range of ideas, memories, and relationships that an individual has unwittingly picked up and organized into verbal meaning. Wealth and stimulation of the early educational environment (granting emotional receptivity) plays an influential role.

Picture Arrangement. This is a test of anticipation and visual organization. The meaningful continuity of everyday experiences is largely dependent upon anticipations, making it possible to understand events in the context of their antecedents and consequences. In this subtest the subject draws from each sketch an anticipation of the meaning of the whole series as well as its possible antecedents and consequences. Speed is also a factor.

Picture Completion. This test taps primarily the function of concentration, but also involves to some extent visual organization. It requires a deliberate focusing of attention, an active searching of

the picture, and the checking of this picture against internalized patterns.

Object Assembly. Good performance on this test requires both adequate anticipations and visual organization. While these are essential for good performance, it is believed that visual-motor coordination is the basic function measured. Speed of performance is also a factor in this test.

Block Design. This is also a test of visual-motor coordination, but it differs from Object Assembly in that the subject does not make anticipations from the meanings of the component parts. The subject calls for thought processes analogous to those involved in concept formation. Analysis and synthesis are involved in a steady interaction between the presented pattern and the available blocks. The speed of motor action must be geared to the acuity and speed of visual analysis and organization for most efficient performance.

Digit Symbol. Since speed is especially essential for good performance, this test measures concentration as well as visual-motor coordination. Motor manipulations are more complex than in the other tests, and a learning factor is involved. The amount of learning appears to depend largely upon the adequacy of concentration.⁸

School Achievement. School achievement as it is used in this thesis means the ability to grasp the fundamental concepts of Reading, Spelling, and Arithmetic; also the ability to retain and apply this knowledge at the request of the examiner. School achievement is

⁸ David Rapaport and others, Diagnostic Psychological Testing (Chicago: Yearbook Publishers, 1945), Volume I. The indented material is paraphrased rather than directly quoted.

the end product of specific instruction, usually from a school, and is not assimilated incidentally nor does it develop without practice.

CHAPTER II

REVIEW OF THE LITERATURE

Just how far back this problem dates is difficult to determine. Probably the first attempted solution to the problem using psychological tests was in 1905. The French Minister of Public Instruction had appointed a commission to study procedures for the education of subnormal children in the Paris schools. The plan was to eliminate from the ordinary schools those children who were unable to profit from the ordinary curriculum. It was to meet this problem that Alfred Binet, in collaboration with Theodore Simon, constructed the well-known Binet-Simon Scale. The test was purported to measure a general factor of intelligence. While the test was very effective in discovering cases of subnormality, it could not determine with comfortable probability the potential achievement ability of any single individual. The failure to achieve a perfect correlation between intelligence test results and school achievement has frequently been examined, and the conclusions are generally grouped into three fundamental categories: (1) the effect of cultural advantages or limitations; (2) conative and adjustment factors such as motivation, emotional stability, etc.;

and (3) a discrepancy between the functions necessary for school achievement and those tapped in the intelligence tests. Although these categories are not mutually exclusive, mainly those studies referable to category number three will be of relevance to this thesis.

I. LITERATURE ON THE WECHSLER SUBTESTS AS THEY RELATE TO SCHOOL ACHIEVEMENT

Wechsler, in referring to reports made by a number of his examiners, states: "The combined scores of these two tests (Arithmetic and Information) frequently furnished an accurate estimate of the subject's scholastic achievement".¹ These reports were based wholly upon clinical experience and not founded in research.

An analysis of the relation between the Wechsler Children's Scale (WISC) and the Reading, Spelling, and Arithmetic scores of the Iowa Basic Skills Test yields somewhat different results. Stroud and his associates used 75 subjects who were enrolled in grades 3 through 6, with mean IQs of 89. By using a multiple correlational technique, the most useful subtests for predicting school achievement were Arithmetic, Vocabulary, Block Design,

¹Wechsler, op. cit., pp. 82-83.

and Object Assembly. The multiple r 's with Reading, Spelling and Arithmetic respectively were .72, .68, and .74. An inspection of the individual correlations show that Object Assembly, Block Design and all Verbal subtests except Digit Span correlate highest with the criterion.²

A similar study by Frandsen using 83 relatively superior High School students correlated the Wechsler-Bellevue Scale with three year average grade-point ratios. All subtests were given except Vocabulary. Frandsen found the Full Scale IQ and Verbal IQ both predicting efficiently; the correlation of each was .69. The subtests correlated with grade-point ratio as follows:

Information	.56	Picture Arrangement	.15
Comprehension	.51	Picture Completion	.26
Digit Span	.45	Block Design	.44
Arithmetic	.55	Object Assembly	.11
Similarities	.54	Digit Symbol	.36

Frandsen combines various subtests in nine different ways to obtain correlations which range from .60 to .71.³ This suggests that High School achievement, for all practical

² James Stroud, Paul Blommers, and Margaret Lauber, "Correlation analysis of WISC and achievement tests," Journal of Educational Psychology, III (1957), 18-26.

³ Arden N. Frandsen, "The Wechsler-Bellevue Intelligence Scale and High School achievement," Journal of Applied Psychology, XXXIV (1950), 406-411.

purposes, can be best predicted with the Full Scale and Verbal scores. These results are largely in agreement with Stroud's findings with the exception of the Object Assembly subtest.

Several studies have investigated the use of the Wechsler-Bellevue Scale for diagnosing reading difficulties. Graham, in two separate studies, had found a specific "non-reader" profile which corresponds closely to Wechsler's "adolescent psychopath" profile. His earlier study consisted of children from eight to sixteen years of age, who were 25 per cent or more below the mean reading grade level on the Wide Range Achievement Test. They were educationally retarded and not in trouble with the law. The unsuccessful readers had the greatest difficulty with Information, Arithmetic, Digit Span, and Digit Symbol. Graham suggests that the tasks demanded in these four subtests most closely resemble the classroom situation, and that the non-reader may be unconsciously resisting the emotional climate of school.⁴

In his later study, using inmates of a Federal Correctional Institution, he again found that only the poor

⁴E. E. Graham, "Wechsler-Bellevue and WISC scattergrams of unsuccessful readers," Journal of Consulting Psychology, XVI (1952), 268-271.

readers had the profile similar to that described by Wechsler as typical of the youthful psychopath. All of the Verbal subtests and Digit Symbol were found to be lower for the poor readers at the .01 level of significance.⁵

Spache also reports marked differences between Verbal and Performance scores with retarded readers. Two-thirds of his one hundred subjects were distinctly poorer in verbal abilities.⁶

Altus studied twenty-five school children in grades three through eight, whose reading disabilities were defined as a two year discrepancy according to the WISC Full Scale IQ. The poorest test performances were noted in Digit Symbol, Arithmetic and Information.⁷

A study by Neville, in which thirty-five pairs of subjects matched for age, IQ, and sex were compared with respect to achievement levels, found the retarded readers significantly low in Information, Arithmetic, and Digit Span, and significantly high in Picture Arrangement and

⁵E. E. Graham and D. Kamano, "Reading failure as a factor in the WAIS subtest pattern of youthful offenders," Journal of Clinical Psychology, XIV (1958), 302-303.

⁶G. D. Spache, "Intellectual and personality characteristics of retarded readers," Psychology Newsletter, XIX (N.Y.U. 1957), 9-12.

⁷Grace T. Altus, "A WISC profile for retarded readers," Journal of Consulting Psychology, XX (1956), 155-156.

Block Design.⁸

Flanary compared ninety poor readers with twenty normal readers (all adolescents) with respect to Wechsler-Bellevue scores. By figuring the per cent of each group that falls above or below certain determined points, he was able to select those subtests which most clearly differentiate between reading success and failure. The subtests are Information, Comprehension, Digit Span, Arithmetic, Similarities, Vocabulary, Picture Arrangement, and Digit Symbol.⁹

Sandercock, utilizing academic success as an external criterion of intelligence among ninety mentally defective children, found the Verbal IQ and Full Scale IQ to be equally valid measures of intelligence. He reports correlation coefficients of .53 with Verbal IQ, .41 with Performance IQ, and .51 with Full Scale IQ.¹⁰

⁸ Donald Neville, "A comparison of the WISC patterns of male retarded and non-retarded readers," Journal of Educational Research, LIV (1961), 195-197.

⁹ Woodrow Flanary, "A study of the possible use of the Wechsler-Bellevue Scale in diagnosis of reading difficulties of adolescent youth," Dissertation Abstracts, XIV (1954), 1045.

¹⁰ Marian G. Sandercock and Alfred Butler, "An analysis of the performance of mental defectives on the Wechsler Intelligence Scale for Children," American Journal of Mental Deficiency, LVII (1952), 100-105.

Summary. Regardless of the wide differences in subjects used, ages, experimental design, the specific form of the Wechsler, and the criterion variables, there is a considerable degree of consistency. While the Verbal subtests are generally found to be most useful for the prediction of school achievement, there is disagreement with regard to Digit Span. Information and Arithmetic are repeatedly among those which correlate best with academic achievement.

There is nearly total agreement that Digit Symbol is singularly the best of the Performance (Non-Verbal) subtests for predicting achievement. Block Design is also reported by some authors to be a valuable subtest for predicting achievement.

II. LITERATURE ON THE VARIABILITY OF SUBTESTS

In the recent past a vast number of papers have appeared in journals relating school failure, and more specifically reading failure, to various types of personality and emotional maladjustments. Typical of such studies are those by Schubert,¹¹ Solomon,¹² and

¹¹ Delwyn Schubert, "Emotional and personality problems of retarded readers," Exceptional Child, XX (1954), 226-228.

¹² Ruth Solomon, "Personality adjustment to reading success and failure," Supplementary Educational Monograph, No. 77 (1953), 64-82.

Shultis.¹³ The general conclusions of all of these studies is that retarded readers show inferior personal-social adjustment when compared to the successful readers. These studies describe poor readers as infantile, dependent, withdrawn, unable to handle aggression, hostile, neurotic, orally sadistic, and probably many other such "negative" characteristics. It is quite obvious that children with adjustment problems are not going to be as receptive to education as are normal children, and conversely, it is not unusual for children with intellectual deficits to develop adjustment problems under the pressures of an educational system in which they are unable to compete.

In this study, an effort was made to examine inter-test variability, that is, the spread of the scaled scores in the individual test records with regard to school achievement. Wechsler has stated that mentally disturbed persons show greater inter-test variability, and reports significant differences in variability when he compares normal subjects with schizophrenic subjects. Wechsler uses an average deviation of each subtest from the mean of each individual record as a measurement of variability.¹⁴

¹³George Shultis, "Cognitive and personality differences in 'orality' between successful and disabled readers," Dissertation Abstracts, XIX (1959), 2153.

¹⁴Wechsler, op. cit., (1958), pp. 162-163.

Alper found with institutionalized retarded children on the Wechsler Intelligence Scale for Children that subtest variability was not related significantly to the magnitude of the IQ.¹⁵

One study was found in the literature which is directly related to subtest variability and achievement. McLean, using a group of neuro-psychiatric patients of a V.A. Hospital, found that those of relatively little subtest variation achieved higher learning scores. McLean used standard deviations of the weighted scores as a measurement of variability.¹⁶

¹⁵ A. E. Alper, "An analysis of the Wechsler Intelligence for Children with institutionalized mental defectives," Dissertation Abstracts, XX (1960), 4711.

¹⁶ O. S. McLean, "Divergent scores on the Wechsler-Bellevue Scale as indicators of learning ability," Journal of Clinical Psychology, X (1954), 264-266.

CHAPTER III

PROCEDURE

I. SELECTION AND DESCRIPTION OF SUBJECTS

Eighty records of retarded patients were withdrawn from the files of Glenwood State School. Because there were no other subjects eligible for this study, it was necessary to utilize all who qualified rather than select by random choice. The sample is nevertheless considered a good representation of the higher level retardate committed to the Glenwood facility, excluding those who are psychotic and those with gross physical handicaps. According to the existing nomenclature developed and used by the American Association of Mental Deficiency, the descriptive terminology for the group used includes the moderately retarded, mildly retarded, and borderline level of intelligence.¹ Forty-five males and thirty-five females were chosen on the basis of age, IQ, and the required test

¹ R. Heber, "A Manual on Terminology and Classification in Mental Retardation," American Journal of Mental Deficiency Monograph Supplement, LXIV (1959), 58-59; and R. Heber, "Modifications in the Manual on Terminology and Classification in Mental Retardation," American Journal of Mental Deficiency, LXV (1961), 499-500.

data. The chronological age range of 16-0 to 29-11 was selected to minimize the age factor since the special adjustments for age which Wechsler proposes would confound the data by altering the total scores and not the individual subtest scores. The IQs, as determined by the Wechsler-Bellevue Full Scale score, range from 41 to 80, and are distributed in a bell-shaped but somewhat platykurtic fashion.

Patients diagnosed as psychotic, and those manifesting extensive physical handicaps were not included in the sample selection. Diagnoses of psychosis were based largely upon one or more projective devices including the Rorschach, Thematic Apperception Test, H-T-P Drawings, as well as corroborating behavioral analyses. The physically handicapped eliminated were those with noticeable involvement of one or both arms or hands, or disrupted speech, hearing, or visual acuity, to the extent of noticeably hindering test performance.

There is some justification for believing that this sample is not typical of all individuals who are functioning at the same IQ range. The increasing disparity between the Verbal and Performance IQs of the Wechsler-Bellevue Scale associated with increasing Full Scale IQ, as shown in Table I, is a bit irregular. Granted that the sampling here is not entirely adequate particularly at the

TABLE I
THE RELATION OF WECHSLER-BELLEVUE VERBAL IQ TO PERFORMANCE
IQ AT VARIOUS LEVELS OF FULL SCALE IQ

Levels of Full Scale IQ	Mean Full Scale IQ	Number of Cases	Mean Verbal IQ	Mean Performance IQ
71-80	74.1	15	68.7	83.8
61-70	65.3	31	66.3	69.9
51-60	55.4	24	59.2	59.5
41-50	45.7	10	56.0	45.8

extremes, the fact that the same relation is found with each sex separately adds to the credibility of the findings. While several had normal Performance IQs and retarded Verbal IQs, the opposite of this was not found. According to Wechsler's normative data, a narrowing of this disparity would be expected at the higher IQ ranges since the normal IQ range typically shows equality of the two Scales with large samples.

There are several possible explanations for this phenomena. First, commitments to the Glenwood institution are not made on the basis of IQ alone, but include many characteristics of the tentative patient, his family constellation, community resources and pressures, and the factors of institutional treatment. Currently in use is a rating form developed by Pedrini and others for a systematic evaluation of these factors in determining admissions.² Although this form was not in use when most of the subjects in this study were admitted, essentially the same criterion were being used but not as systematically.

The social criterion is probably one of the most

²D. T. Pedrini and others, "Pre-admission examination and admission determination," American Journal of Mental Deficiency, (Nov. 1961), 370-374.

important, because communities frequently provide for their retarded citizens only as long as no social problems occur. In this regard, Sarason makes this comment on the difficulty of obtaining valid test results:

It appears that the bulk of the mentally retarded are found primarily in lower social classes and the cultural matrix of these classes is different in important respects from that of other groups. Because of the cultural bias in conventional tests, the intellectual potential of this group, as well as its level of functioning outside the test situation, cannot be assumed to have been adequately assessed.³

Not only the cultural but the educational environment as well would have some effect upon intellectual growth. It certainly seems tenable that poor educational facilities, and the lack of verbal stimulation, would contribute to the stultification of verbal development. Very closely related to this is a study by Cutts and Lane, in which the duration of institutionalization was found to be inversely related to verbal intelligence.⁴

The relation between the Verbal and Performance at the 41 to 50 IQ level shown in Table I is probably an artifact of the extrapolated normative data. In any event,

³ S. B. Sarason, Psychological Problems in Mental Deficiency (New York: Harper & Bros., 1953), p. 446.

⁴ R. A. Cutts and M. O. Lane, "The effects of hospitalization on Wechsler-Bellevue subtest scores by mental defectives," American Journal of Mental Deficiency, LI (1947), 391-393.

meaningful inferences cannot be drawn from relationships at the lower ends of the Scales due to insufficient standardization. Wechsler's standardization sample is briefly discussed under the subheading "Description and Administration of Tests".

The matter of etiologies and biographical data is not considered in this thesis for several reasons. The differential diagnosis of mental retardation is a complex and difficult task and there is still considerable disagreement in this area. Contradictory results are reported in the literature on the relation of etiological classification and school achievement, but the length of prior community schooling was found to be an unimportant variable.^{5,6} Contradictory results are also found between etiological classification and the Wechsler-Bellevue test scores. Most studies confirm Wechsler's findings regarding mental retardate's superior scores on the Performance Scale

⁵G. J. Bensberg, Jr., "The relation of academic achievement of mental defectives to mental age, sex, institutionalization, and etiology," American Journal of Mental Deficiency, LVIII (1953), 327-330.

⁶David Gibson and others, "Academic successes among high grade mentally retarded children as a function of intelligence and etiological classification," American Journal of Mental Deficiency, LXIII (1959), 852-859.

regardless of etiology.^{7,8,9,10}

Much research on the effects of brain damage upon intelligence test results have also shown many inconsistencies. O'Kelly, who approaches the problem from a standpoint of adaptation and adjustment to loss, offers the following opinion:

Our approach . . . looks upon the traumatizing agent as an only one of many factors whose combined action serves to bring about disturbed behavior under certain conditions and in certain personalities. If this is a correct way of looking at the problem, then it follows that all individuals exposed to the same objective extent of trauma will not inevitably develop the same symptoms. The traumatizing agent acts upon specific individuals, and the resultant is equally individual.¹¹

⁷R. A. Cutts and W. Sloan, "Test pattern of adjusted defectives on the Wechsler-Bellevue Test," American Journal of Mental Deficiency, L (1945), 89-101.

⁸Sue Allen Warren and Matthew J. Kraus, Jr., "WAIS Verbal minus Performance IQ comparisons in mental retardates," Journal of Clinical Psychology, XVIII (1961), 57-58.

⁹J. Binkley, and others. "Pattern of Mental Defectives on the Wechsler-Bellevue Scale," Unpublished paper (1948), Pacific State Hospital Library, Pomona, Calif.

¹⁰R. E. McKenzie, "A study of the Wechsler-Bellevue Intelligence Scale and the VIBS short form in an Institution for the Mentally Defective," American Journal of Mental Deficiency, LVI (1951), 174-176.

¹¹L. I. O'Kelly, Introduction to Psychopathology (New York: Prentice Hall, Inc., 1949), p. 411.

II. DESCRIPTION AND ADMINISTRATION OF TESTS

In order to determine the concurrent relationship between specific intellectual functions and school achievement, it was necessary to administer both tests to the same subjects at the same sitting. The tests were administered and scored by staff psychologists or psychological trainees working under supervision.

The Wechsler-Bellevue Intelligence Scale (W-B) yields three IQ scores; Verbal IQ (VIQ), Performance or Non-Verbal IQ (PIQ), and a combination of these two Scales termed Full Scale IQ (FSIQ). The IQ for each Scale is derived by a deviation method with reference to the mean of the appropriate age level.¹² The test consists of eleven subtests, of which six are supposedly verbal in content and five non-verbal. The assumed intellectual functions measured by each of these subtests is presented in Chapter I. While the reliabilities of certain subtests are small (ranging from .42 to .83 with a sample of retardates),¹³ and objective data on validity is considered

¹²Wechsler, op. cit., (1944), p. 219.

¹³Alfred Butler, "Test-retest and split half reliabilities of the Wechsler-Bellevue scales and subtests with mental defectives," American Journal of Mental Deficiency, LIX (1954), 80-84.

inadequate,¹⁴ the test has nevertheless gained widespread acceptance as a measure of intelligence for adolescents and adults. Guertin and associates offer the following opinion on the position of the Wechsler-Bellevue Scale.

As time passes the Wechsler-Bellevue and its later forms seem to attain an increasingly venerable position. It is now the well accepted standard of intelligence evaluation for adults. As many tests of varied composition are correlated with the Wechsler-Bellevue, it becomes clear that the W-B occupies a central position in evaluating the factor of general intelligence. . . .¹⁵

The Scale was standardized on 1750 subjects of both sexes. The subjects were mostly urban from the City and State of New York, but were matched against the total population of the United States as to age, sex, education, and occupation. Wechsler states that three per cent of his sample were known mental defectives. Two hundred such cases were available to him to make random selections at all ages and for both sexes.¹⁶ In the group which Wechsler terms mentally defective (IQs below 66), the actual number of subjects was so small that the norms at the lower

¹⁴ A. Anastasi, Psychological Testing (New York: The Macmillan Company, 1957), p. 318.

¹⁵ W. H. Guertin and others, "Research with the Wechsler-Bellevue Intelligence Scale: 1950-1955," Psychological Bulletin, LIII (1956), 235-257.

¹⁶ Wechsler, op. cit., (1944), p. 112.

ends of the Scales were determined by extrapolation. Both forms I and II, supposedly equivalent forms, were used in this study. Barry, Fulkerson and Kubala report statistically significant differences between the two forms on the individual subtest level,¹⁷ however, these differences are numerically very small and probably would have little effect on the results of this study.

The Wide Range Achievement Test (WRAT) is an individually administered test of Reading, Spelling and Arithmetic. The test is standardized for individual use on approximately fifteen hundred students from kindergarten through the senior year of college. Since the author was unable to standardize the test on a national scale, the grade norms were made to conform to those of the New Stanford Achievement Tests. Jastak does not state the exact method used, but explains that correlations between the two tests were computed from raw scores before the grade norms were established. Items were chosen by an item analysis based on the percentage of successes at each grade level. Test-retest reliabilities range from .88 to .95 for approximately 115 subjects. Validity coefficients determined by correlations between the WRAT and the New

¹⁷ John Barry and others, "Score equivalence of the Wechsler-Bellevue Intelligence Scale, Forms I and II," Journal of Clinical Psychology, XII (1956), 57-60.

Standard Achievement Test are for Reading .84, Spelling .93 and Arithmetic .91 (140 subjects in the 7th and 8th grades).¹⁸

The chief distinction of the WRAT is its suitability for individual clinical work. The author believes word pronunciation to be the most appropriate diagnostic tool relative to reading, since reading disability, Jastak claims, is practically always a deficiency in the mastery of the mechanics and not of comprehension. The Reading test of the WRAT, therefore, is a test of word pronunciation. The Spelling test is administered by simple dictation by the examiner; this method seems to be simpler to administer but as accurate as the sentence tests used in other scales. The Arithmetic test is based upon orally presented numerical reasoning and written computation.

III. STATISTICAL PROCEDURE

Two primary problems were postulated and tested: (1) What is the relation between the Wechsler-Bellevue subtest scores and the Reading, Spelling, and Arithmetic achievement scores? (2) What relation exists between the

¹⁸ Joseph Jastak, Wide Range Achievement Test (Wilmington, Del.: Charles Z. Story Co., 1946), pp. 3-4.

Wechsler subtest variance and the achievement of Reading and Spelling on the WRAT.

In order to determine the predictive value of the Wechsler-Bellevue subtest scores for academic achievement, all weighted scores of the Wechsler-Bellevue I and II were correlated with the Reading, Spelling, and Arithmetic scores of the WRAT by the Pearson Product-Moment method. With those correlations between subtests and total scores in which the subtest is a part, e.g., Vocabulary with the Verbal Scale, part-whole corrections were made by a formula recommended by McNemar.¹⁹

Due to a large number of zero scores on the Arithmetic subtest, and consequently the possibility of spurious correlations, it was necessary to dichotomize the scores and compute all correlations with that subtest using a point biserial technique.

An attempt was made to reduce the influence of strong Verbal and Non-Verbal factors through the computation of partial correlations. An analysis of the intercorrelations revealed that Comprehension in the Verbal Scale, and Object Assembly in the Performance Scale, correlated

¹⁹Q. McNemar, Psychological Statistics (New York: John Wiley and Sons, 1949), p. 139.

highly with the other subtests in their respective Scales, yet the correlations between these two subtests and the criterion were found not to be outstanding. The partial correlations were computed between the individual subtests and the achievement scores, attempting to partial out the Verbal and Non-Verbal factors and obtain correlations between the more specific factors in each subtest and the criterion.

To test for a relation between W-B subtest variability and WRAT achievement, standard deviations were computed for subtest variation on each individual test record, as well as individual ranges for subtest variability on Verbal and Performance Scales separately. Reading and Spelling scores were averaged in order to obtain a more stable index of achievement. The sample was then divided into one group of achievers on Reading-Spelling, and one group of under-achievers on Reading-Spelling, each group consisting of 31 subjects. The under-achievers are defined as those whose achievement grade levels fall 25 per cent or more below expectation. All subjects have grade expectancies between 3.0 and 5.4, and achievement deficiencies of at least one grade level. A breakdown of the cases, grade expectancies, means, and deviations is given in Appendix A. Eighteen of the original eighty

subjects were not included in this portion of the study for two reasons: (1) all subjects whose Full Scale IQs fell below 50 were excluded because their achievement expectancies were too low to make meaningful differentiations between the achievers and the under-achievers; and (2) it was necessary to exclude some subjects in order to make the two groups similar in Full Scale IQ, range, and Standard Deviation. The group of under-achievers have a mean Full Scale IQ of 63.90 and Standard Deviation of 6.85, compared to a mean Full Scale IQ of 62.67 and Standard Deviation of 6.95 for the group of achievers. Both groups have Full Scale IQ ranges from 51 to 75.

The expected achievement level was determined by using a conversion table provided in the WRAT manual.²⁰ In this table, for example, a Full Scale IQ of 62 converts to a grade equivalent of 4.0 (fourth grade). If this subject actually achieves a score of 2.0, he is then achieving 50 per cent below expectation. In this study, the group of under-achievers are on the average 45 per cent below their expected grade levels, whereas the group of achievers are achieving about their expected grade levels (within 25 per cent).

²⁰ Jastak, op. cit., pp. 7-8.

The standard deviations and ranges were divided into high and low groups by using a figure as close to the median as possible in all cases, and were related to achievement by means of a fourfold contingency table. Chi square and contingency coefficients were then computed on the basis of these contingency tables and significance levels were determined. All statistical formulas used are given in Appendix B.

CHAPTER IV

RESULTS

The correlational matrix shown in Table II reveals generally lower correlational coefficients than those of Wechsler's matrix with normal subjects (see Appendix C). This suggests less interdependence of functions among subtests with the retarded sample than with the normal sample. It is of interest to compare this finding with those of Garrett's analysis of correlations between various intelligence test items. He concludes in his study that the mind of a small child is relatively undifferentiated, and that a process of progressive specialization or differentiation of the mind continues all through childhood and into adulthood.¹ One may conclude from this comparison that either the retarded adolescent and adult do not have the "mind of a child", or that the correlations in this study are substantially lower than Wechsler's due to the lack of variability of the subtests with the retarded sample. Probably both are contributory.

It should also be noted that the Performance subtests

¹H. E. Garrett, "A developmental theory of intelligence," American Psychologist, I (1946), 373-78.

TABLE II

INTERCORRELATION OF WECHSLER-BELLEVUE SUBTESTS AND WIDE RANGE ACHIEVEMENT SCORES

	Information	Comprehension	Digit Span	Arithmetic	Similarities	Vocabulary	Picture Arrangement	Picture Comprehension	Block Design	Object Assembly	Digit Symbol	Verbal Score	Performance	Full Scale
1. Information	.316													
2. Comprehension	.257	.239												
3. Digit Span	.111	.374	.249											
4. Arithmetic	.343	.444	.188	.174										
5. Similarities	.318	.475	.286	.171	.295									
6. Vocabulary	.182	.290	.295	.250	.342	.166								
7. Picture Arr.	.124	.243	.110	.063	.112	.164	.288							
8. Picture Comp.	.031	.128	-.112	.206	.110	-.023	.266	.337						
9. Block Design	.051	.138	.239	.294	.087	.151	.252	.592	.435					
10. Object Assembly	-.008	.088	.056	.140	.265	.044	.281	.296	.407	.364				
11. Digit Symbol	.435	.642	.456	.417	.553	.554	.391	.249	.069	.220	.200			
* Verbal	.117	.254	.178	.226	.266	.115	.499	.658	.600	.652	.566	.323		
* Performance	.318	.468	.360	.377	.453	.352	.563	.610	.494	.611	.518	--	--	
* Full Scale	.418	.095	.283	.167	.443	.284	.196	-.075	.239	.066	.369	.458	.212	.364
A WRAT Reading	.385	.078	.230	.162	.468	.242	.202	-.063	.275	.021	.430	.436	.228	.362
B WRAT Spelling	.244	.349	.299	.439	.426	.204	.450	.282	.473	.306	.539	.544	.569	.676
C WRAT Arithmetic	3.43	4.77	3.23	1.35	4.35	4.58	4.05	5.88	4.51	7.95	5.08	17.6	26.3	44.5
Mean	1.47	1.81	2.02	1.56	1.84	1.54	2.92	2.95	2.71	3.32	2.16	5.51	9.88	12.7
SD														

+All correlations with the Arithmetic subtest are point biserial correlations.

*The Verbal, Performance, and Full Scale correlations are corrected for contamination by

Q. McNemar's Part-Whole technique.

correlate higher with the Full Scale than does the Verbal Scale. This may also be attributed to a greater variance in the Performance subtests with a number of very high scaled scores which would have a disproportionate influence on the derived Full Scale score.

The Verbal score is found to be most closely related to academic achievement with correlations of .458 with Reading, .436 with Spelling, and .544 with Arithmetic. It is found, however, that both the Performance and the Full Scale correlate slightly higher with Arithmetic achievement, with coefficients of .569 and .676 respectively.

The single subtest found to be most closely related to WRAT academic achievement is Similarities, having correlational coefficients of .443, .468, and .426 for Reading, Spelling, and Arithmetic respectively. The second best is Digit Symbol with a .369 with Reading, .430 with Spelling, and .539 with Arithmetic.

Those subtests which correlate highest with Reading are Information .418, Similarities .443, and Digit Symbol .369. The same three subtests also correlate highest with Spelling, the coefficients being Information .385, Similarities .468, and Digit Symbol .430. Jastak's contention that reading and spelling involve the same psychological functions appears to be supported by these data.

Achievement of Arithmetic is found to involve some different functions. Naturally, the correlation with the Arithmetic subtest would be expected to be high. However, four other subtests are found to correlate equally well. They are Similarities .426, Picture Arrangement .450, Block Design .473, and Digit Symbol .539. Since nearly half of the subjects were unable to score on the Arithmetic subtest, the results involving that particular subtest may be invalid.

As was previously stated, partial correlations were computed between the subtests and the achievement scores, partialling out the Verbal and Non-Verbal factors in an attempt to derive correlations between the more specific factors in each subtest and the criterion. These results are reported in Table III. The correlations with Reading and Spelling remain relatively unchanged, but all correlations with Arithmetic achievement are decreased. This would seem to suggest that Arithmetic achievement is more dependent upon the Verbal and/or Non-Verbal factors than is either Reading or Spelling, therefore, when these two factors are partialled out the correlations between the individual subtests and Arithmetic achievement are slightly reduced. This is given additional support by the fact that the two subtests which appear to best represent the Verbal and Non-Verbal factors (Comprehension and Object Assembly)

TABLE III

PARTIAL CORRELATIONS BETWEEN WECHSLER-BELLEVUE SUBTESTS
AND WIDE RANGE ACHIEVEMENT SCORES, WITH
COMPREHENSION AND OBJECT ASSEMBLY
ELIMINATED

	Reading	Spelling	Arithmetic
Information	.409	.382	.151
Digit Span	.269	.218	.238
Arithmetic	.142	.144	.354
Similarities	.449	.484	.322
Vocabulary	.272	.234	.046
Picture Arrangement	.186	.202	.404
Picture Completion	-.141	-.093	.132
Block Design	.236	.294	.396
Digit Symbol	.371	.453	.483

are themselves substantially related to Arithmetic achievement but not to Reading nor Spelling.

In comparing the Reading-Spelling achievers with the under-achievers in regard to subtest variability, all relations were found to be very small and statistically insignificant. The results are shown in Table IV. With both standard deviations and ranges used for measuring variance of the eleven subtests, chi squares of .58 and contingency coefficients of .09 were obtained. This indicates that inter-subtest variability of the Verbal Scale, Performance Scale, and Full Scale scores have nothing to offer diagnostically to the assessment of Reading and Spelling abilities with retardates. This of course does not mean that other means of appraising deviations or divergencies between subtests would prove to be as fruitless. One possible explanation for the insignificant findings is that the considerable variability found in mental retardates tends to mask any variability which might be produced by such factors as personal-social adjustment or educational deficiencies.

The range between the high and low scaled Wechsler scores was quite high. The medians of these ranges are 8.9 for the eleven subtest scaled scores; 5.3 for the six Verbal scaled scores; and 6.8 for the five Performance scaled

TABLE IV
WECHSLER SUBTEST VARIANCE RELATED TO
READING-SPELLING PROFICIENCY

	Median Score	Chi Square	Contingency Coefficient
Eleven subtests (S.D.)	2.36	.58	.096
Eleven subtests (Range)	8.9	.58	.096
Verbal subtests (Range)	5.3	2.60	.064
Performance tests (Range)	6.8	.06	.030

scores. The difference found here between the Verbal and Performance Scales is not particularly meaningful since the Performance Scale is higher than the Verbal Scale in a majority of the subjects.

CHAPTER V

DISCUSSION OF THE RESULTS

No attempt will be made to solve the cause and effect argument concerning whether certain subjects score poorly on the W-B Scale due to their lack of education, or whether they achieve poorly as a result of certain intellectual deficits. We do know, however, that certain tests are influenced by achievement, and that certain tests influence achievement, but we do not know the extent or degree of this influence. In this chapter, Reading, Spelling, and Arithmetic will be discussed in terms of the subtest compositions, that is, the intellectual functions upon which various achievement skills appear to be related.

The Reading portion of the WRAT involves the recognition of individual letters of the alphabet at the lower end of the scale, and reading and pronouncing individual words throughout the main portion of the scale. Reading is found to be related most highly to Similarities, Information, and Digit Symbol, and in that order. The intellectual functions which, according to Rapaport, are believed to be associated with these subtests are abstract reasoning, memory, visual-motor coordination, concentration, and learning. Possibly all three of these subtests

have in common a Verbal Comprehension factor, as Similarities and Information are highly verbal, and Wechsler reports that Digit Symbol often shows a substantial loading on a Verbal factor.¹ Other common elements determined by factor analysis are loading of the Memory factor in both Information and Digit Symbol. In this study Digit Symbol is more closely related to Similarities than to any other Verbal subtest, and it correlates very poorly with Information, suggesting that with retardates the associative learning involved in Digit Symbol is more important than with the normal population, and is related more closely to abstract reasoning ability. This, of course, needs further investigation.

A reasonable amount of concentration is necessary for achievement, however, the Digit Span and Arithmetic subtests which are believed to be better measurements of concentration and attention are not found to be highly correlated with Reading. Visual-motor proficiency does not appear to have qualities directly essential for Reading achievement, however, there are several studies on brain damage which purport a direct relationship between visual-motor coordination, abstract reasoning, memory span, and

¹Wechsler, op. cit., (1958), 131.

concentration.²

The Spelling section of the WRAT yields basically the same relationships with the W-B subtests as does Reading. A correlation of .87 between Reading and Spelling is a strong indication that the same intellectual abilities are necessary for both achievement skills. Digit Symbol correlates slightly higher with Spelling than with Reading probably due to a stronger and more direct influence of visual-motor speed and proficiency.

In addition to Similarities and Digit Symbol which have already been discussed, Arithmetic achievement correlates well with the subtests Arithmetic, Picture Arrangement, and Block Design. Block Design, according to Rapaport, involves not only visual analysis and organization, but also functions analogous to that measured in Similarities, however, these two subtests are related very poorly in this study. The ability to analyze and synthesize in the Block Design subtest is believed to be related to concept formation or abstract thinking. Wechsler's review of the factorial composition of Block Design indicates that apart from g, almost its entire communality is accounted

²L. Bender, "The psychological problems of children with organic brain disorders," American Journal of Orthopsychiatry, XIX (1949), 404.

for by the Non-Verbal Organization factor.³

Picture Arrangement loads consistently at all ages on the Non-Verbal Organization factor, and also shows significant loading on the Memory factor. Consistent with this is the fact that the Arithmetic subtest shows its highest loading on the Memory factor. Wechsler makes this statement regarding the abilities necessary for proficiency in mathematics; "Reasoning ability seems to have been considerably overestimated and, if our findings are correct, sheer memory substantially underestimated."⁴

Of the five subtests found to be most closely related to achievement of Arithmetic, all but Similarities and Block Design have significant loading of the Memory factor, and these two tests are postulated to include some form of concept formation or abstract reasoning. Wechsler, Israel, and Babinsky have found Similarities and Block Design to be the best tests, or at least the most discriminating tests, for use with borderline and mildly retarded cases.⁵

³Wechsler, op. cit., (1958), pp. 133-134.

⁴Ibid., p. 130.

⁵David Wechsler, et al., "A study of the subtests of the Wechsler-Bellevue Intelligence Scale in borderline and mentally defective cases," American Journal of Mental Deficiency, VI (1941), 555-558.

In spite of the fact that Reading, Spelling, and Arithmetic all appear to involve memory and abstract reasoning, there is a definite schism between Reading-Spelling achievement and Arithmetic achievement. The subtests Comprehension, Arithmetic, Picture Arrangement, and Object Assembly are found to correlate substantially with Arithmetic achievement, and correlate very poorly with the Reading-Spelling combination. On the other hand, Information and Vocabulary correlate relatively high with Reading-Spelling, and poorly with Arithmetic achievement. Much of this difference may be explained by a closer relation of Arithmetic to the Non-Verbal factor, and Reading-Spelling achievement to the Verbal factor. Comprehension is the only subtest that cannot be accounted for on this basis, since the main variance of the test is accounted for by the g and Verbal Comprehension factors. One study by Davis, however, has found loadings in a Numerical Facility factor as well as Verbal, Visual, and General Reasoning factors.⁶ Caution should be exercised, however, in making inferences about the performance of retardates on the W-B subtests since the factor analytic studies were based upon the performance of intellectually normal adults.

⁶F. B. Davis, "A factor analysis of the Wechsler-Bellevue Scale," Educational Psychological Measurement, XVI (1956), 127-146.

CHAPTER VI

SUMMARY AND CONCLUSIONS

I. SUMMARY

The purpose of this study was to examine possible uses of the Wechsler-Bellevue Intelligence Scale for determining level of school achievement among institutionalized retardates, and in so doing, to reflect upon various intellectual attributes necessary for achievement efficiency. Two primary problems were postulated and tested: (1) To determine the relation between the Wechsler-Bellevue subtests and the Reading, Spelling, and Arithmetic scores of the Wide Range Achievement Test; and (2) To examine the relation between variance or dispersion of the Wechsler subtests and the concomitant achievement in Reading and Spelling.

Eighty institutionalized retardates ranging in age from 16-0 to 29-11, and in IQ from 41 to 80 were selected for this study. The first problem was met by an analysis of the correlation coefficients between the Wechsler-Bellevue scores and the achievement scores ($n = 80$). The Verbal Scale correlates highly with the three achievement scores, however, both the Performance and Full Scale

correlate better with achievement of Arithmetic. Similarities and Digit Symbol were found to be the best subtests for determining overall achievement. Along with these two subtests, Information also is closely related to Reading and Spelling. Those subtests which correlate highest with Arithmetic are Similarities, Digit Symbol, Block Design, Picture Arrangement, and as expected, Arithmetic.

An analysis of the subtest compositions according to both clinical assumptions and the various factorial findings discussed by Wechsler reveals no clear-cut patterns but suggest two major requisites for achievement proficiency. These requisites would be the ability to think in abstract terms and manipulate symbols both visually and verbally, and the ability to concentrate and memorize.

The second problem tested revealed insignificant relations between subtest variability and achievement scores ($n = 62$). Standard Deviations and ranges were compared with achievers and under-achievers by means of chi squares and contingency coefficients computed from a fourfold contingency table. All coefficients fell below a .10 level of significance.

II. CONCLUSIONS

In general, it is concluded that the Wechsler-Bellevue Scale is a useful instrument for the analysis

and possibly the prediction of academic achievement. One should be chary, however, in utilizing the Full Scale score for making estimates of scholastic potentialities. At least a superficial inspection of the individual subtest scaled scores should be made and considered in such determinations. To this date, eligibility for special education classes in some public school systems are inflexibly and unreasonably based upon an IQ score as the most important if not the only criterion. If any one score is to be used, the Verbal IQ might be better than the Performance IQ or Full Scale IQ, although such a use of the IQ cannot be recommended.

Through an intelligent analysis of the subtest and total scores, one should be able to make better guesses referable to school achievement. It should be pointed out, however, that the correlations reported in this study and all other studies are far from perfect, and that many other factors not dealt with in this thesis, both of a cognitive and conative nature, should be considered if one is to ultimately reach a reliable level of prediction.

BIBLIOGRAPHY

BIBLIOGRAPHY

- Alper, A. E. An analysis of the Wechsler Intelligence Scale for Children with institutionalized mental defectives. Disser. Absts., 1960, 20, 4711.
- Altus, G. T. A WISC profile for retarded readers. J. Consult. Psych., 1956, 20, 155-156.
- Anastasi, A. Psychological Testing. New York: The Macmillan Co., 1957.
- Barry, J. R., Fulkerson, S. C., Kubala, A. L., and Seaquist, M. R. Score equivalence of the Wechsler-Bellevue Intelligence Scale, Form I and II. J. Clin. Psych., 1956, 12, 57-60.
- Bender, L. The psychological problems of children with organic brain disorders. Amer. J. Orthopsychtry., 1949, 31, 404.
- Bensberg, G. J., Jr. The relation of academic achievement of mental defectives to mental age, sex, institutionalization, and etiology. Amer. J. Ment. Def., 1953, 58, 327-330.
- Binkley, J. Pattern of mental defectives on the Wechsler-Bellevue Scale. Unpublished paper, Pacific State Hospital Library, 1948.
- Butler, A. Test-retest and split half reliabilities of the Wechsler-Bellevue Scales and subtests with mental defectives. Amer. J. Ment. Def., 1954, 59, 80-84.
- Cutts, R. A., Lane, M. O. The effect of hospitalization on Wechsler-Bellevue subtest scores by mental defectives. Amer. J. Ment. Def., 1947, 51, 391-393.
- _____ and Sloan, W. Test pattern of adjusted defectives on the Wechsler-Bellevue Test. Amer. J. Ment. Def., 1945, 50, 98-101.
- Davis, F. B. A factor analysis of the Wechsler-Bellevue Scale. Ed. Psych. Meas., 1956, 16, 127-146.

- Flanary, W. A study of the possible use of the Wechsler-Bellevue Scale in diagnosis of reading difficulties of adolescent youth. Disser. Absts., 1954, 14, 1045.
- Frandsen, A. N. The Wechsler-Bellevue Intelligence Scale and High School achievement. J. Appl. Psych., 1950, 34, 406-411.
- Freeman, F. S. Theory and Practice of Psychological Testing. Third Edition. New York: Holt, Rinehart, and Winston, 1962.
- Garrett, H. E. A developmental theory of intelligence. Amer. Psychast., 1946, 1, 372-378.
- Gibson, D., Jephcott, A. E., and Wilkins, R. Academic successes among high grade mentally retarded children as a function of intelligence and etiological classification. Amer. J. Ment. Def., 1959, 63, 852-859.
- Graham, E. E. Wechsler-Bellevue and WISC scattergrams of unsuccessful readers. J. Consult. Psych., 1952, 16, 268-271.
- _____ and Kamano, D. Reading failure as a factor in the WAIS subtest pattern of youthful offenders. J. Clin. Psych., 1958, 14, 302-305.
- Guertin, W. H., Frank, G. H., and Rabin, A. I. Research with the Wechsler-Bellevue Intelligence Scale: 1950-1955. Psychol. Bull., 1956, 53, 235-257.
- Guilford, J. P. The structure of intellect. Psychol. Bull., 1953, 53, 267.
- Heber, R. A manual on terminology and classification in mental retardation. Amer. J. Ment. Def. Mono. Supp., 1959, 64.
- _____. Modification in the manual on terminology and classification in mental retardation. Amer. J. Ment. Def., 1961, 65, 499-500.
- Jastak, J. Wide Range Achievement Test. Wilmington, Del.: Charles Z. Story Co., 1946.
- McKenzie, R. E. A study of the Wechsler-Bellevue Intelligence Scale and the VIB short form in an institution for the mentally defective. Amer. J. Ment. Def., 1951, 56, 174-176.

- McLean, O. S. Divergent scores on the Wechsler-Bellevue Scale as indicators of learning ability. J. Clin. Psych., 1954, 10, 264-266.
- McNemar, Q. Psychological Statistics. New York: John Wiley and Sons, 1949.
- Neville, D. A comparison of the WISC patterns of male retarded and non-retarded readers. J. Ed. Res., 1961, 54, 195-197.
- O'Kelly, L. I. Introduction to Psychopathology. New York: Prentice Hall, Inc., 1949.
- Pedrin, D. T., Mursell, G. R., and Bergman, J. Pre-admission examination and admission determination. Amer. J. Ment. Def., 1961, 66, 370-374.
- Rapaport, D., Gill, M., and Shafer, R. Diagnostic Psychological Testing. Volume I. Chicago: Yearbook Publishers, 1945-1946.
- Sandercock, M. G. and Butler, A. An analysis of the performance of mental defectives on the Wechsler Intelligence Scale for Children. Amer. J. Ment. Def., 1952, 57, 100-105.
- Sarason, S. B. Psychological Problems in Mental Deficiency. New York: Harper & Bros., 1953.
- Schubert, D. Emotional and personality problems of retarded readers. Except. Child., 1954, 20, 226-228.
- Shultis, G. Cognitive and personality differences in 'orality' between successful and disabled readers. Disser. Absts., 1959, 19, 2153.
- Simrall, D. Intelligence and the ability to learn. J. Psych., 1947, 23, 27-42.
- Solomon, R. Personality adjustment to reading success and failure. Supp. Ed. Mono., 1953, 77, 64-82.
- Spache, G. D. Intellectual and personality characteristics of retarded readers. Psych. Newsletter, (N.Y.U.), 1957, 19, 9-12.
- Spearman, C. E. The theory of two factors. Psych. Rev., 1914, 21, 101-115.

- Spearman, C. E. The Nature of "Intelligence" and the Principles of Cognition. London: Macmillan and Co., 1927.
- Stroud, J., Blommers, P., and Lauber, M. Correlation analysis of WISC and achievement tests. J. Ed. Psych., 1957, 48, 18-26.
- Thorndike, E. L. Educational Psychology, Vol. III. New York: Teachers College, 1914.
- Thurstone, L. L. The Vectors of Mind. Chicago: Univ. of Chicago Press, 1935.
- Walker, H. M. and Lev, J. Statistical Inference. New York: Henry Holt and Co., 1953.
- Warren, S. A., and Kraus, M. J., Jr. WAIS Verbal minus Performance IQ comparisons in mental retardates. J. Clin. Psych., 1961, 17, 57-58.
- Wechsler, D., Israel, H., and Babinsky, B. A study of the subtests of the Wechsler-Bellevue Scale in borderline and mentally defective cases. Amer. J. Ment. Def., 1941, 45, 555-558.
- Wechsler, D. The Measurement of Adult Intelligence. Third Edition. Baltimore: Williams and Wilkins, 1944.
- _____. The Measurement and Appraisal of Adult Intelligence. Fourth Edition. Baltimore: Williams and Wilkins, 1958.

APPENDIX

APPENDIX A

DISTRIBUTION OF UNDER-ACHIEVERS AND DEVIATIONS
FROM GRADE EXPECTANCY

Grade Ex- pectancy	Number of Cases	Mean Grade Level	Range of Deviations	Mean Deviation
3.0 - 3.9	11	1.78	-1.0 to -2.0	-1.45
4.0 - 4.9	15	2.31	-1.1 to -3.1	-2.16
5.0 - 5.4	5	3.44	-1.4 to -2.4	-1.70

APPENDIX B

STATISTICAL FORMULAS USED

Standard Deviation

$$SD = \sqrt{\frac{N \cdot \sum y^2 - (\sum y)^2}{N^2}}$$

Part-Whole Correlation

$$r_1(t-1) = \frac{r_{1t} \sigma_t - \sigma_1}{\sqrt{\sigma_t^2 + \sigma_1^2 - 2r_{1t} \sigma_1 \sigma_t}}$$

Pearson Product-Moment and Point Biserial Correlations

$$r \text{ and } r_{pb} = \frac{N \cdot \sum XY - \sum X \cdot \sum Y}{\sqrt{(N \sum X^2 - [\sum X]^2)(N \sum Y^2 - [\sum Y]^2)}}$$

Partial Correlation

$$r_{C4 \cdot 2} = \frac{r_{C4} - r_{C2} r_{24}}{\sqrt{1 - r_{C2}^2} \sqrt{1 - r_{24}^2}}$$

Chi Square

$$\chi^2 = \frac{(ad - bc)^2 N}{(a + b)(c + d)(a + c)(b + d)}$$

Contingency Coefficient

$$C = \sqrt{\frac{\chi^2}{\chi^2 + N}}$$

APPENDIX C

WECHSLER'S INTERCORRELATIONS OF THE 1939 STANDARDIZATION

	Comprehension	Information	Digit Span	Arithmetic	Picture Arrangement	Picture Comprehension	Block Design	Object Assembly	Digit Symbol	Similarities
Comprehension	.688									
Information	.444	.484								
Digit Span	.517	.596	.443							
Arithmetic	.391	.384	.264	.366						
Picture Arrangement	.456	.465	.297	.403	.389					
Picture Completion	.465	.488	.399	.514	.484	.566				
Block Design	.286	.224	.155	.233	.272	.439	.536			
Object Assembly	.478	.561	.539	.429	.444	.400	.538	.319		
Digit Symbol	.721	.679	.379	.600	.488	.456	.537	.306	.508	
Similarities	.661	.667	.509	.625	.514	.605	.714	.409	.673	.727
Full Scale										

Note: All Similarities intercorrelations based on data of 150 cases, ages 15-49.
The remainder of the intercorrelations are based on the adult samplings of
ages 20-34, 350 cases.